# Investigation of AI-based dual-model strategy for monitoring cyanobacterial blooms from Sentinel-3 in Korean inland waters

Hoang Hai Nguyen\*, Dalgeun Lee\*\*, Sunghwa Choi\*\*\*, Daeyun Shin\*\*\*\*

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## Abstract

The frequent occurrence of cyanobacterial harmful algal blooms (CHABs) in inland waters under climate change seriously damages the ecosystem and human health and is becoming a big problem in South Korea. Satellite remote sensing is suggested for effective monitoring CHABs at a larger scale of water bodies since the traditional method based on sparse in-situ networks is limited in space. However, utilizing a standalone variable of satellite reflectances in common CHABs dual-models, which relies on both chlorophyll-a (Chl-a) and phycocyanin or cyanobacteria cells (Cyano-cell), is not fully beneficial because their seasonal variation is highly impacted by surrounding meteorological and bio-environmental factors. Along with the development of Artificial Intelligence (AI), monitoring CHABs from space with analyzing the effects of environmental factors is accessible.

This study aimed to investigate the potential application of AI in the dual-model strategy (Chl-a and Cyano-cell are output parameters) for monitoring seasonal dynamics of CHABs from satellites over Korean inland waters. The Sentinel-3 satellite was selected in this study due to the variety of spectral bands and its unique band (620 nm), which is sensitive to cyanobacteria. Via the AI-based feature selection, we analyzed the relationships between two output parameters and major parameters (satellite water-leaving reflectances at different spectral bands), together with auxiliary (meteorological and bio-environmental) parameters, to select the most important ones. Several AI models were then employed for modelling Chl-a and Cyano-cell concentration from those selected important parameters. Performance evaluation of the AI models and their comparison to traditional semi-analytical models were conducted to demonstrate whether AI models (using water-leaving reflectances and environmental variables) outperform traditional models (using water-leaving reflectances only) and which AI models are superior for monitoring CHABs from Sentinel-3 satellite over a Korean inland water body.

Keywords : AI, Cyanobacterial blooms, Sentinel-3, Water-leaving reflectances, Environment

\* Senior Researcher, Sejong Rain Co. Ltd, Daejeon, Republic of Korea. ·E-mail : hai.nh1812@gmail.com

\*\* National Disaster Management Research Institute, Ulsan, Republic of Korea

\*\*\* School of Civil and Environmental Engineering, Yonsei University, Seoul, Republic of Korea

\*\*\*\* CEO, Sejong Rain Co. Ltd, Daejeon, Republic of Korea. ·E-mail : pushindy@gmail.com